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To Advance the Science of Cold-blooded Vertebrates

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FROGS IN JAPAN

With her dominions extending from the north to the south through the frigid, temperate and torrid zones, Japan possesses a great variety of frogs. The known species of frogs in the land are about sixty in number, but the chances are that many more will be discovered as investigations go on. Of the sixty species ten are of the toad kind, one of *suzu-gayerau* (*Bombina orientalis* literally, bell-frog), four of the tree-frog, three of the *hime-amagayeru* (*Microhyla fissipes*), one of the *jimoguri-hayeru* (*Cacopoides Tornieri*), twenty-eight of the wood frog, two of the singing frog and ten of the *ao-gayeru* (*Rhacophorus*). As it will be seen, the wood frogs are the greatest in number, constituting one-third of the total.

From the zoogeographical point of view, the Japanese frogs belong both to the palaearctic region and the Oriental region. It is evident that frogs belonging to both regions must have lived in this country too in very remote ages when the Asiatic continent and our land were united. Since those times our frogs have undergone many changes until they have produced some new species or sub-species. Turning our eyes to

Japan alone, we find that the frogs belonging to the palaearctic region live in Saghalien, Hokkaidô and north Corea, while those belonging to the Oriental region live in Formosa, the Loo Choo islands, and Amami Oshima island. It may be observed that in other districts of the country race complexes of these two categories of frogs exist, but generally speaking, the number of frogs belonging to the palaearctic region preponderate.

To determine the line of demarcation between the two main regions of the distribution of the frogs it is necessary to refer to the line suggested by Prof. Watase, which he proposed to draw between Yaku and Tanegashima islands on one side and Amami Oshima island on the other, to the south of Kyushu. This proposition is now found to be well-founded, on the strength of evidence furnished by the investigations carried on in regard to the distribution of the other branches of animals, such as mammals and birds. Therefore, I may be permitted to call this line the Watase's line. It may be remembered that in the beginning of the Meiji era, Captain Blakiston proposed to draw a line of demarcation between Hokkaidô on one side and the mainland on the other along the Tsugaru Strait, seeing that there were clear evidences in the mainland of the existence of race complexes of birds while in Hokkaidô and Saghalien genuine races of birds belonging to the palaearctic region existed. This conclusion was arrived at by the Captain by the study of the distributon of birds in this country, but later researches conducted by other scholars with regard to mammals and reptiles have proved the justice of his conclusion, hence the name of the Blakiston line.

We have, moreover, to consider the provisional lines that may be drawn between Hokkaidô and Saghalien along the Sôya Strait in one case and in the other that may be drawn between the mainland and Corea along the Tsushima strait (or, more strictly speaking, along the Eastern Channel of Tsushima, because Tsushima

island more properly belongs to the peninsula). In short, in Japan, the elements of the palaearctic regions outweigh the elements of the other region, and the frogs themselves are the same in species with those living on the Asiatic continent and in some cases are allied in kind to them.

Indigenous kinds of frogs are very few in Japan. Only the following are of this latter kind as found in the mainland of Japan: *Kajika-gayera* (*Polypedates buergeri*), *Mori-aogayeru* (*Rhacophorus sch. var. arborea*), *Schlegel-aogayeru* (*Rhacophorus schlegelii*), *Kita-aogayeru* (*Rhacophorus sch. var. intermedia*), *Tago-gayeru* (*Rana Tagoi*). Those native to the Loo Choo islands are *Holst-gayeru* (*Babina Holsti*), *Ishikawa-gayeru* (*Rana Ishikawae*), *Otton-gayeru* (*Babina subaspersa*), *Owston-acgayeru* (*Rhacophorus Oswtoni*), *Ao-gayeru* (*Rhacophorus viridis*), *Nihon-Kajika-gayeru* (*Polypedates japonicus*) and those belonging to Formosa are *Taiwan-gayeru* (*Rana taipehensis*), *Hara-buchi-gayeru* (*Rana adenopleura*), *Buto-aogayeru* (*Rhacophorus robustus*.

The *kajika-gayeru* (*Polypedates Buergeri*), singing frog is appreciated for its faculty of singing in a peculiar staccato voice. So those of this kind that are famed for their excellent singing fetch high prices. They are found in the mainland, Shikoku and Kyushu, living in the mountain streams, and send forth their voices in a still clear, high-pitched tone. From the end of June to the middle of July, they spawn on the lake-side or by the side of the pool of a mountain rivulet.

The *mori-aogayeru* (*Rhacophorus Schleg*: *var. arborea*), lives in the mainland from the middle northward, and is distinguished by its peculiar habits of spawning. The female of this kind of frog lays its eggs on the branches of trees beside a lake, bog or pond about two or three feet above the water level or sometimes ten feet high up. The spawn thus emitted is of milk-white colour and of the size of a hunting cap. Im-

mediately after emission from the female's body the spawn is a transparent gelatinous substance, but after being agitated by the males the substance turns into a large foam-like mass. The eggs in the mass are large milk-white globules.

The tadpoles immediately after they are hatched are of white colour but by degrees the black pigment increases in them and when the tadpoles drop from the spawn mass to the water they are very much blacker. A peculiar habit with this kind of frog is to be noticed in the manner of fertilization of one female by several males instead of one as in the case of other species of frogs. This kind of frog inhabits the mountain districts and therefore its spawn masses like toy balloons are to be met with hanging on the tree branches at Mt. Kôya in Wakayama prefecture, or in Nara Park in Nara prefecture, or on the Lake of Towada in Akita prefecture or on the lakes near Mt. Hakkôda or Mt. Osore, from the end of May to the end of July.

The *Schlegel-aogayeru* (*Rhacophorus Schlegelii*) resembles the *mori-aogayeru* in shape, but is different from the latter in respect of the habit of spawning. It lays eggs in the months of April and May in the ground of the border of paddy-fields. The spawn mass of this frog is smaller than that of the *mori-aogayeru*, but likewise looks like froth. The *holst-gayeru* (*Babina Holsti*), in the Loo Choo islands is a huge frog, the largest of all frogs in Japan. It is remarkable for the five toes on each of its fore-legs. The first toe of these has a bony projection in the shape of a prickle, which injures one sometimes when he tries to catch it. In the island of Amami Oshima there is another kind of frog called *otton-kayeru* (*Babina subaspersa*), which is allied to former. This inhabits also the mountainous districts and is as large as the *holst-gayeru*.

It may be mentioned that the *holst-gayeru* goes by the name of *waku-bichi* in the Loo Choo islands. This is eaten as ordinary food or used for medicinal purposes. It is sold for about 1 yen per pound and is

much appreciated. In the daytime it lurks in the crevices of rocks in the mountains and comes out at night for food. It often lives in the holes of a tree and there lays eggs. Besides, in the Loo Choo islands and the island of Amami Oshima there is another big kind of frog called *Namiye-kayeru* (*Rana Namiyei*) which lives in the mountains and is used as food and medicine.

In Japan the custom has been known from old of using frogs as medicines for consumptive diseases or others, so much as that the *yama-akagayeru* (*Rana temporaria ornativentris* literally, mountain wood frogs) in the province of Omi is a noted creature in that part of the country. Formerly indeed, the wood frogs were often used as food, being roasted and seasoned with soy. But nowadays the kind of frog called *tonosama-gayeru* (*Rana nigromaculata*) having a green skin is used in great numbers for a dish in European style cooking. It is to be mentioned that in Formosa and the Loo Choo islands edible frogs are placed in the market, which incidentally testifies to the fact that the manner of cooking in those localities is akin to that of China.

In the Loo Choo islands the kind of frog called *numa-gayeru* (*Rana limnocharis*) which is abundant in the waterly fields are sold in the market with their skins flayed and the entrails taken out, being put on bamboo skewers. Because the *numa-gayeru* fetches the price of 1 sen (half a farthing) per head and the *waku-bichi* 1.30 yen (about 2 shillings) per head, the frog-catchers are doing a good business, and therefore it is no wonder that they are plying their trade as a hereditary profession in the capital of Okinawa islands. The kinds of frogs that are eaten in Formosa are the *babatopafu-gayeru* (*Rana rugulosa*), *trafu-gayeru* (*Rana tigrina*), and *plansi-kayeru* (*Rana Plancyi*).

In 1918 or thereabouts Professor Watase introduced bull-frogs (*Rana catesbiana*) into this country, which were propagated at the Imperial University of Tôkyô.

Since then their descendants have greatly multiplied in many places of this country. We may, therefore, reasonably expect that before long this kind of frog will be generally placed in the market for food purposes.

It goes without saying that frogs are in intimate relationship with agriculture. Especially those frogs called *tonosama-gayeru* so numerous in the paddy-fields do much good to the farmers by destroying noxious insects. From the fact that frogs prey upon the harmful insects during the night, when they do the most harm, they do more good than the birds in helping the farmers. Besides the frogs, being vegetarian in their inclination and little accustomed to eating shell-fish, are better suited to render services to humanity. As far as my investigations go, the frog's food consists chiefly of various kinds of insects and besides spiders, small shells and also leeches and earthworms. Of the insects devoured by the frogs two-thirds are harmful insects and the rest useful ones. That is to say, these insects mostly belong to *Coleoptera*.

It should be added that frogs are sometimes used as a bait for catching the catfish, or also as food for chickens. The manufacturing of small articles for decoration out of the toad's skin (*Bufo vulgaris japonicus* and *Bufo vulgaris formosus*) once so popular is now nearly out of fashion.

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NOTE

Mr. Radcliffe's note in Copeia for February 25th is very interesting. It notes the landing in Boston of an "Opah" from the Western Bank near Sable Island and "Skilligalee" from George's Bank. The scientific names of these fishes are worthy of notice.

The Opah (Lampris) was named *regius*, *guttatus* and

luna at about the same time. Of these names, *regius* seems to be the oldest.

The "Skilligalee" should apparently stand as *Makaira albida* (Poey). The name "*imperator*" was given to a bad drawing of a young Sword-fish. The European name, *Tetrapturus belone*, stands but the American *albida* is a very different species, having the anterior dorsal rays high—the others behind regularly shortened. *Tetrapturus* is found in the Old World only. In this genus the middle posterior rays are elevated, somewhat approaching the Sail-fish, *Istiophorus*.

DAVID STARR JORDAN

NOTE

MM. Cahn and Shumway record in the Copeia of February, 1926, the occasional occurrence of melanistic and albino larvae of *Necturus maculosus*. The cited rare occurrence of these variates (8 in 714 in 1924; 3 in 976 in 1925), lends interest to the following collection record.

On July 24, 1924, in the south branch of the Au Sable River, between Roscommon and St. Helen's Lake, Roscommon County, Michigan, a 114 mm. Necturus, having no traces of the normal dorsolateral yellowish stripes, but totally black above and of normal sootiness below, was collected in a minnow seine. During nearly three and one half months of seining on this river system only three other mudpuppies were caught, so they cannot be considered present in abundance in this river system, but, of course, no percentage could be suggested on this basis.

T. H. LANGLOIS

NOTE

Due to typographical errors, the following changes should be made in my article "Descriptions of a new Characin fish and a new Pygidiid Catfish from the Amazon Basin" in Copeia No. 156. The

specific name *Pyrrhulina obermulleri* should be *Pyrrhulina obermülleri*. In line 9 of the description of this fish substitute "originating" for "oringinating". Page 151, line 16, substitute "Obermüller" for "Obermuller". Page 152, first line, the type locality of *P. gabrieli* should read "São Gabriel rapids, Rio Negro, Brazil, in rock-pools." Page 152, line 9, substitute "size" for "sixe". My name is misspelled at the end of the article.

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